WHAT IS CLAIMED IS:

1. A polynomial predistorter for predistorting a complex modulated baseband signal, providing the predistorted signal to a power amplifier, and compensating for the non-linear distortion characteristic of the power amplifier using complex vector multiplication, comprising:

a first complex multiplier for generating first complex predistortion gains using a current input signal and complex polynomial coefficients, for in-phase (I) predistortion and quadrature-phase (Q) predistortion, the complex polynomial coefficients being modeled on the inverse non-linear distortion characteristic of the power amplifier, and multiplying the first complex predistortion gains by I and Q signal components of the current input signal, respectively;

at least one second complex multiplier for generating second complex predistortion gains using the complex polynomial coefficients and previous predistorted signals corresponding to the complex polynomial coefficients, for the I predistortion and the Q predistortion, and multiplying the second complex predistortion gains by I and Q signal components of the previous predistorted signals, respectively; and

a summer for generating a predistorted signal by summing outputs of the first and second complex multipliers and outputting the predistorted signal to the power amplifier.

2. The polynomial predistorter of claim 1, wherein the complex polynomial coefficients are determined such that the predistorted signal is output to an input of an amplifier output.

3. The polynomial predistorter of claim 1, wherein the predistorted signal is calculated using

$$\mathbf{d(n)} = \mathbf{d_i(n)} + \mathbf{jd_q(n)} = \mathbf{x(n)E(c_i + jc_q)}$$

$$\begin{aligned}\mathbf{x(n)} = [&\mathbf{x_i(n), x_q(n), x_i(n)|x(n)|, x_q(n)|x(n)|, \ldots, x_i(n)|x(n)|^{P-1}, x_q(n)|x(n)|^{P-1},}\\ &\mathbf{d_i(n-1), d_q(n-1), d_i(n-1)|d(n-1)|, d_q(n-1)|d(n-1)|, \ldots,}\\ &\qquad\mathbf{d_i(n-1)|d(n-1)|^{P-1}, d_q(n-1)|d(n-1)|^{P-1},}\\ &\mathbf{d_i(n-M), d_q(n-M), d_i(n-M)|d(n-M)|, d_q(n-M)|d(n-M)|, \ldots,}\\ &\qquad\mathbf{d_i(n-M)|d(n-M)|^{P-1}, d_q(n-M)|d(n-M)|^{P-1}]}\end{aligned}$$

$$\begin{aligned}\mathbf{c_i} &= [\mathbf{c_{ii,0,0}, c_{iq,0,0}, \ldots, c_{ii,0,(P-1)}, c_{iq,0,(P-1)}, c_{ii,1,0}, c_{iq,1,0}, \ldots, c_{ii,1,(P-1)}, c_{iq,1,(P-1)}, \ldots,}\\ &\quad\mathbf{c_{ii,M,0}, c_{iq,M,0}, \ldots, c_{ii,M,(P-1)}, c_{iq,M,(P-1)}}]^T\\ \mathbf{c_q} &= [\mathbf{c_{qi,0,0}, c_{qq,0,0}, \ldots, c_{qi,0,(P-1)}, c_{qq,0,(P-1)}, c_{qi,1,0}, c_{qq,1,0}, \ldots, c_{qi,1,(P-1)}, c_{qq,1,(P-1)}, \ldots,}\\ &\quad\mathbf{c_{qi,M,0}, c_{qq,M,0}, \ldots, c_{qi,M,(P-1)}, c_{qq,M,(P-1)}}]^T\end{aligned}$$

where d(n) is the predistorted signal including an I signal component $d_i(n)$ and a Q signal component $d_q(n)$, x(n) is the input signal including an I signal component $x_i(n)$ and a Q signal component $x_q(n)$, c_i is an I polynomial coefficient including c_{ii} and c_{iq} that affect $x_i(n)$ and $x_q(n)$, respectively, c_q is a Q polynomial coefficient including c_{qi} and c_{qq} that affect $x_i(n)$ and $x_q(n)$, respectively, P is the order of the polynomial, and M is the number of previous signals to consider.

4. The polynomial predistorter of claim 1, wherein each of the first and second complex predistortion gains includes an I complex predistortion gain and a Q complex predistortion gain which are multiplied respectively by the I and Q signal components of the input signal and the previous predistorted signals.

5. The polynomial predistorter of claim 4, wherein the first complex predistortion gains are calculated using

$$
\begin{aligned}
p &= c_{ii,0,0} + c_{ii,0,1}|x(n)| + \ldots + c_{ii,0,(P-1)}|x(n)|^{(P-1)} \\
q &= c_{iq,0,0} + c_{iq,0,1}|x(n)| + \ldots + c_{iq,0,(P-1)}|x(n)|^{(P-1)} \\
r &= c_{qi,0,0} + c_{qi,0,1}|x(n)| + \ldots + c_{qi,0,(P-1)}|x(n)|^{(P-1)} \\
s &= c_{qq,0,0} + c_{qq,0,1}|x(n)| + \ldots + c_{qq,0,(P-1)}|x(n)|^{(P-1)}
\end{aligned}
$$

where x(n) is the input signal, p and q are I predistortion gains by which the I and Q signal components of the input signal are multiplied, r and s are Q predistortion gains by which the I and Q signal components of the input signal are multiplied, c_{ii} and c_{iq} are I polynomial coefficients that affect the I and Q signal components of the input signal, respectively, c_{qi} and c_{qq} are Q polynomial coefficients that affect the I and Q signal components of the input signal, respectively, P is the order of the polynomial, and M is the number of previous signals to consider.

6. The polynomial predistorter of claim 4, wherein the second complex predistortion gains are calculated using

$$
\begin{aligned}
p &= c_{ii,m,0} + c_{ii,m,1}|d(n-m)| + \ldots + c_{ii,m,(P-1)}|d(n-m)|^{(P-1)} \\
q &= c_{iq,m,0} + c_{qi,m,1}|d(n-m)| + \ldots + c_{iq,m,(P-1)}|d(n-m)|^{(P-1)} \\
r &= c_{qi,m,0} + c_{qi,m,1}|d(n-m)| + \ldots + c_{qi,m,(P-1)}|d(n-m)|^{(P-1)} \\
s &= c_{qq,m,0} + c_{qq,m,1}|d(n-m)| + \ldots + c_{qq,m,(P-1)}|d(n-m)|^{(P-1)}
\end{aligned}
$$

where d(n-m) is an mth previous predistorted signal, p and q are I predistortion gains by which the I and Q signal components of the input signal are multiplied, r and s are Q predistortion gains by which the I and Q signal components of the input signal are multiplied, c_{ii} and c_{iq} are I polynomial coefficients that affect the I and Q signal components of the input signal, respectively, c_{qi} and c_{qq} are Q polynomial coefficients that affect the I and Q signal components of the input signal, respectively, P is the order of the polynomial, and M is the number of previous signals to consider.

7. A polynomial predistorting method of predistorting a complex modulated baseband signal, providing the predistorted signal to a power amplifier, and compensating for the non-linear distortion characteristic of the power amplifier using complex vector multiplication, comprising the steps of:

generating first complex predistortion gains using a current input signal and complex polynomial coefficients, for in-phase (I) predistortion and quadrature-phase (Q) predistortion, the complex polynomial coefficients being modeled on the inverse non-linear distortion characteristic of the power amplifier, and multiplying the first complex predistortion gains by I and Q signal components of the current input signal, respectively;

generating second complex predistortion gains using the complex polynomial coefficients and a predetermined number of previous predistorted signals, for the I predistortion and the Q predistortion, and multiplying the second complex predistortion gains by I and Q signal components of the previous predistorted signals, respectively; and

generating a predistorted signal by summing outputs of the first and second complex multipliers and outputting the predistorted signal to the power amplifier.

8. The polynomial predistorting method of claim 7, wherein the complex polynomial coefficients are determined such that the predistorted signal is output to an input of an amplifier output.

9. The polynomial predistorting method of claim 7, wherein the predistorted signal is calculated using

$$\mathbf{d(n)} = \mathbf{d_i(n)} + \mathbf{jd_q(n)} = \mathbf{x(n)}\mathrm{E}(\mathbf{c_i} + \mathbf{jc_q})$$

$$\begin{aligned}\mathbf{x}(n) = [&x_i(n), x_q(n), x_i(n)|x(n)|, x_q(n)|x(n)|, \ldots, x_i(n)|x(n)|^{P-1}, x_q(n)|x(n)|^{P-1},\\ &d_i(n-1), d_q(n-1), d_i(n-1)|d(n-1)|, d_q(n-1)|d(n-1)|, \ldots,\\ &\qquad d_i(n-1)|d(n-1)|^{P-1}, d_q(n-1)|d(n-1)|^{P-1},\\ &d_i(n-M), d_q(n-M), d_i(n-M)|d(n-M)|, d_q(n-M)|d(n-M)|, \ldots,\\ &\qquad d_i(n-M)|d(n-M)|^{P-1}, d_q(n-M)|d(n-M)|^{P-1}]\end{aligned}$$

$$\begin{aligned}\mathbf{c}_i &= [c_{ii,0,0}, c_{iq,0,0}, \ldots, c_{ii,0,(P-1)}, c_{iq,0,(P-1)}, c_{ii,1,0}, c_{iq,1,0}, \ldots, c_{ii,1,(P-1)}, c_{iq,1,(P-1)}, \ldots,\\ &\quad c_{ii,M,0}, c_{iq,M,0}, \ldots, c_{ii,M,(P-1)}, c_{iq,M,(P-1)}]^T\\ \mathbf{c}_q &= [c_{qi,0,0}, c_{qq,0,0}, \ldots, c_{qi,0,(P-1)}, c_{qq,0,(P-1)}, c_{qi,1,0}, c_{qq,1,0}, \ldots, c_{qi,1,(P-1)}, c_{qq,1,(P-1)}, \ldots,\\ &\quad c_{qi,M,0}, c_{qq,M,0}, \ldots, c_{qi,M,(P-1)}, c_{qq,M,(P-1)}]^T\end{aligned}$$

where $d(n)$ is the predistorted signal including an I signal component $d_i(n)$ and a Q signal component $d_q(n)$, $x(n)$ is the input signal including an I signal component $x_i(n)$ and a Q signal component $x_q(n)$, c_i is an I polynomial coefficient including c_{ii} and c_{iq} that affect $x_i(n)$ and $x_q(n)$, respectively, c_q is a Q polynomial coefficient including c_{qi} and c_{qq} that affect $x_i(n)$ and $x_q(n)$, respectively, P is the order of the polynomial, and M is the number of previous signals to consider.

10. The polynomial predistorting method of claim 7, wherein each of the first and second complex predistortion gains includes an I complex predistortion gain and a Q complex predistortion gain which are multiplied respectively by the I and Q signal components of the input signal and the previous predistorted signals.

11. The polynomial predistorting method of claim 10, wherein the first complex predistortion gains are calculated using

$$\begin{aligned}
p &= c_{ii,0,0} + c_{ii,0,1}|x(n)| + \ldots + c_{ii,0,(P-1)}|x(n)|^{(P-1)} \\
q &= c_{iq,0,0} + c_{iq,0,1}|x(n)| + \ldots + c_{iq,0,(P-1)}|x(n)|^{(P-1)} \\
r &= c_{qi,0,0} + c_{qi,0,1}|x(n)| + \ldots + c_{qi,0,(P-1)}|x(n)|^{(P-1)} \\
s &= c_{qq,0,0} + c_{qq,0,1}|x(n)| + \ldots + c_{qq,0,(P-1)}|x(n)|^{(P-1)}
\end{aligned}$$

where x(n) is the input signal, p and q are I predistortion gains by which the I and Q signal components of the input signal are multiplied, r and s are Q predistortion gains by which the I and Q signal components of the input signal are multiplied, c_{ii} and c_{iq} are I polynomial coefficients that affect the I and Q signal components of the input signal, respectively, c_{qi} and c_{qq} are Q polynomial coefficients that affect the I and Q signal components of the input signal, respectively, P is the order of the polynomial, and M is the number of previous signals to consider.

12. The polynomial predistorting method of claim 10, wherein the second complex predistortion gains are calculated using

$$\begin{aligned}
p &= c_{ii,m,0} + c_{ii,m,1}|d(n-m)| + \ldots + c_{ii,m,(P-1)}|d(n-m)|^{(P-1)} \\
q &= c_{iq,m,0} + c_{qi,m,1}|d(n-m)| + \ldots + c_{iq,m,(P-1)}|d(n-m)|^{(P-1)} \\
r &= c_{qi,m,0} + c_{qi,m,1}|d(n-m)| + \ldots + c_{qi,m,(P-1)}|d(n-m)|^{(P-1)} \\
s &= c_{qq,m,0} + c_{qq,m,1}|d(n-m)| + \ldots + c_{qq,m,(P-1)}|d(n-m)|^{(P-1)}
\end{aligned}$$

where d(n-m) is an mth previous predistorted signal, p and q are I predistortion gains by which the I and Q signal components of the input signal are multiplied, r and s are Q predistortion gains by which the I and Q signal components of the input signal are multiplied, c_{ii} and c_{iq} are I polynomial coefficients that affect the I and Q signal components of the input signal, respectively, c_{qi} and c_{qq} are Q polynomial coefficients that affect the I and Q signal components of the input signal, respectively, P is the order of the polynomial, and M is the number of previous signals to consider.